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| 10/554,006 | 08/02/2006 | Shuichiro Inoue | Y-229 (NUBIC10504) | 4685 |
| 802 | 7590 | 01/21/2010 | EXAMINER | |
| PATENTTM.US | | | STAFFORD, PATRICK | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|---|--|
| Office Action Summary | Application No. 10/554,006 | Applicant(s) INOUE, SHUICHIRO | |
| | Examiner PATRICK STAFFORD | Art Unit 2828 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 October 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 13 October 2009 have been fully considered but they are not persuasive.

In response to applicant's argument that Takeuchi '824 and McCaughan '791 do not teach a long gating period, Takeuchi '824 teaches a single-photon generation device comprising a laser-light source (col. 7, lines 35-37 and Fig. 6, part 9), a quasi-phase-matching wave-guide (col. 7, lines 35-39 and Fig. 6, part 39) that converts one photon from said laser-light source into two photons with a common wavelength (col. 7, lines 61-65), a beam splitter that separates the two photons (col. 7, lines 47-51 and Fig. 6, part 41), a single-photon detector that detects one of the separated photons (col. 7, lines 49-51 and Fig. 6, part 2), and an optical switch that puts the other of the separated photons in and is controlled with the detection signal of said single-photon detector (col. 5, lines 36-40 and Fig. 6, part 4), wherein the single photon detector comprises a gate device (col. 3, lines 51-52 and Fig. 6, part 4) and a gate device controller (col. 3, lines 51-54 and Fig. 6, part 8) and the gate period being a long gate period (col. 4, lines 43-51).

In response to applicant's argument that Takeuchi '824 does not teach a long detection period, Takeuchi '824 teaches the gate period being a long gate period (col. 4, lines 43-51). Applicant argues that Takeuchi '824 only teaches a long detection time but not a long detection period, Takeuchi '824 teaches the detection time being long and the period of this time is subsequently long as the period is the repeated detection time. Therefore, Takeuchi '824 teaches a long detection period.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-9, 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (U.S. Patent 7,088,824, hereafter '824) in view of McCaughan et al (U.S. Patent 6,545,791, hereafter '791).

Claim 1: '824 teaches a single-photon generation device comprising a laser-light source (col. 7, lines 35-37 and Fig. 6, part 9), a quasi-phase-matching wave-guide (col. 7, lines 35-39 and Fig. 6, part 39) that converts one photon from said laser-light source into two photons with a common wavelength (col. 7, lines 61-65), a beam splitter that separates the two photons (col. 7, lines 47-51 and Fig. 6, part 41), a single-photon detector that detects one of the separated photons (col. 7, lines 49-51 and Fig. 6, part 2), and an optical switch that puts the other of the separated photons in and is controlled with the detection signal of said single-photon detector (col. 5, lines 36-40 and Fig. 6, part 4), wherein the single photon detector comprises a gate device (col. 3, lines 51-52 and Fig. 6, part 4) and a gate device controller (col. 3, lines 51-54 and Fig. 6, part 8) and the gate period being a long gate period (col. 4, lines 43-51).

'824 does not explicitly teach the quasi-phase-matching wave-guide being a wave-guide-type quasi-phase-matching LiNbO₃. However, '791 teaches the use of a wave-guide-type quasi-phase-matching LiNbO₃ (col. 11, lines 64-67) in order to provide better overlap between the optical and microwave fields. Therefore it would have been obvious to one of ordinary skill in

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the art at the time the invention was made use a wave-guide-type quasi-phase-matching LiNbO_3 as the quasi-phase-matching wave-guide in order to provide better overlap between the optical and microwave fields.

Claim 3: '824 teaches a single-photon generation device comprising a laser-light source (col. 7, lines 35-37 and Fig. 6, part 9), a quasi-phase-matching wave-guide (col. 7, lines 35-39 and Fig. 6, part 39) that converts one photon from said laser-light source into two photons (col. 7, lines 61-65) and put them out to different directions (col. 7, lines 42-44 and Fig. 6, part 41), a single-photon detector that detects one of the separated photons (col. 7, lines 49-51 and Fig. 6, part 2), and an optical switch that puts the other of the separated photons in and is controlled with the detection signal of said single-photon detector (col. 5, lines 36-40 and Fig. 6, part 4), wherein the single photon detector comprises a gate device (col. 3, lines 51-52 and Fig. 6, part 4) and a gate device controller (col. 3, lines 51-54 and Fig. 6, part 8) and the gate period being a long gate period (col. 4, lines 43-51).

'824 does not explicitly teach the quasi-phase-matching wave-guide being a bulk type wave-guide-type quasi-phase-matching LiNbO_3 . However, '791 teaches the use of a bulk type (col. 11, lines 14-15) wave-guide-type quasi-phase-matching LiNbO_3 (col. 11, lines 64-67) in order to provide better overlap between the optical and microwave fields. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made use a bulk type wave-guide-type quasi-phase-matching LiNbO_3 as the quasi-phase-matching wave-guide in order to provide better overlap between the optical and microwave fields.

Claims 4, 6-7: '824 and '791 teach the single-photon generation device according to claim 3.

They do not explicitly teach the long gate period comprises between 20 ns and 50 ns. However,

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it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the long gate period be between 20 ns and 50 ns, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 5: '824 and '791 teach the single-photon generation device according to claim 3. '824 teaches the laser is a CW laser (col. 6, lines 11-12).

Claims 8, 12-13: 824 and '791 teach the single-photon generation device according to claim 1. They do not explicitly teach the long gate period comprises between 20 ns and 50 ns. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the long gate period be between 20 ns and 50 ns, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 9: '824 and '791 teach the single-photon generation device according to claim 1. '824 teaches the laser is a CW laser (col. 6, lines 11-12).

Claims 2, 10-11, 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (U.S. Patent 7,088,824, hereafter '824) in view of McCaughan et al (U.S. Patent 6,545,791, hereafter '791) and further in view of Baer (U.S. Patent 5,866,911, hereafter '911).

Claim 2: '824 teaches a single-photon generation device comprising a laser-light source (col. 7, lines 35-37 and Fig. 6, part 9), a non-degenerate quasi-phase-matching wave-guide (col. 7, lines 35-39 and Fig. 6, part 39) that converts one photon from said laser-light source into two photons (col. 7, lines 61-65) with different wavelengths (col. 9, lines 58-60), a beam splitter that separates

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the two photons with the different wavelengths (col. 7, lines 47-51 and Fig. 6, part 41), a single-photon detector that detects one of the separated photons (col. 7, lines 49-51 and Fig. 6, part 2), and an optical switch that puts the other of the separated photons in and is controlled with the detection signal of said single-photon detector (col. 5, lines 36-40 and Fig. 6, part 4), wherein the single photon detector comprises a gate device (col. 3, lines 51-52 and Fig. 6, part 4) and a gate device controller (col. 3, lines 51-54 and Fig. 6, part 8) and the gate period being a long gate period (col. 4, lines 43-51).

‘824 does not explicitly teach the quasi-phase-matching wave-guide being a wave-guide-type quasi-phase-matching LiNbO₃. However, ‘791 teaches a wave-guide-type quasi-phase-matching LiNbO₃ (col. 11, lines 64-67) in order to provide better overlap between the optical and microwave fields. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made use a wave-guide-type quasi-phase-matching LiNbO₃ as the quasi-phase-matching wave-guide in order to provide better overlap between the optical and microwave fields.

‘824 and ‘791 do not explicitly teach the beam splitter being a dichroic mirror. However, ‘911 teaches the use of dichroic mirror beam splitters (col. 3, lines 50-54) in order to provide better beam quality and sharpening intensity. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made use a dichroic mirror for the beam splitter in a single photon generation device in order to provide better beam quality and sharpening intensity.

Claims 10, 14-15: ‘824, ‘791 and ‘911 teach the single-photon generation device according to claim 2. They do not explicitly teach the long gate period comprises between 20 ns and 50 ns.

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However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the long gate period be between 20 ns and 50 ns, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 11: '824, '791 and '911 teach the single-photon generation device according to claim 2. '824 teaches the laser is a CW laser (col. 6, lines 11-12).

Conclusion

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PATRICK STAFFORD whose telephone number is (571)270-1275. The examiner can normally be reached on M-Th 7:30-5 EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/P. S./

Examiner, Art Unit 2828

/Minsun Harvey/

Supervisory Patent Examiner, Art Unit 2828